REMARKS:

Status of the Claims:

Claims 1-8 and 10- 28 and new claims 29-32 remain in the case. None of the changes is believed to introduce new matter. Entry and consideration of this Amendment are respectfully requested.

Drawings

The Examiner has indicated that Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. In accordance with the Examiner's request, attached are Replacement Figures 1 and 2.

Claim Rejections - 35 U.S.C. § 103

Claims 1-8,10-16,19-21, and 24-28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hiroaki Sudo (USPN 6,950,474) in view of Sipola (US 2002/0044612), in further view of Applicant's Admitted Prior Art (herein referred to as AAPA).

Claims 17-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hiroaki Sudo (USPN 6,950,474) in view of Sipola (US 2002/0044612) with AAPA as applied to claim 15 above, and further in view of ETSI EN 300744 V1.4.1 (2001-01).

Claims 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiroaki Sudo US patent 6950474 in view of Sipola US Published Application 2002/0044612 with AAPA and further in view of Hosur US Published Application 2001/0033623.

Applicant's Response

The claims have been clarified to recite that the symbol interleaver is selected from a plurality of symbol interleavers available for symbol interleaving in a selected mode of operation. The support for selecting among a plurality of available symbol interleavers can be found, e.g., in the Applicant's specification at paragraph [0086].

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A. Hiroaki Sudo v/o Sipola and AAPA

Claims 1-8,10-16,19-21, and 24-28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hiroaki Sudo (USPN 6,950,474) in view of Sipola (US 2002/0044612), in further view of Applicant's Admitted Prior Art (herein referred to as AAPA).

The Sudo Reference

The Examiner alleges that Sudo effectively teaches at column 3 line 54 to column 4 line 26, the selection of a symbol interleaver. Sudo at column 3 line 54 to column 4 line 33, reads, in part, as follows:

> First, in the transmission system of the first communication apparatus, a transmission signal is stored in retransmission control section 101. This transmission signal is a packet-unit signal, for example. The stored transmission signal is sent by retransmission control section 101 to **first interleave processing section 102 and second interleave processing section 103 according to a preset transmission timing**. ...

> More specifically, a control signal is output from retransmission control section 101 to selector 104, which indicates which of the interleaved signal, from first interleave processing section 102 or from second interleave processing section 103, should be output to transmission OFDM section 105 **depending on whether the packet sent** by retransmission control section 101 **is a signal which will be transmitted for the first time or a signal which will be retransmitted**.

> In this embodiment, it is assumed that when the packet sent by retransmission control section 101 is **a signal which will be transmitted for the first time**, selector 104 outputs the interleaved signal **from first interleave processing section 102** to transmission OFDM section 105 and when the packet sent by retransmission control section 101 is **a signal which will be retransmitted**, selector 104 outputs the interleaved signal **from second interleave processing section 103**.

Thus, it is seen that Sudo discloses a fixed pair of interleavers 102 and 103. Interleaver 102 is used only when there is a first time transmission of a signal. Interleaver 103 is used only when there is a re-transmission of the signal. The cited disclosure in Sudo does not disclose or suggest the Applicant's claimed selecting of a symbol interleaver from a plurality of symbol

interleavers available for symbol interleaving in a selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving.

The cited disclosure in Sudo does not teach selection, as can be seen, in Sudo at column 4 lines 26-33. Depending on whether a signal is to be transmitted for the first time or a signal to be re-transmitted, the interleaved signal proceeding to transmission is always the same. In other words, in first transmissions it is always the signal from interleaving section 102 that is output to transmission section 105 for transmission. In re-transmissions it is always the signal from interleaving section 103 that is output to transmission section 105 for transmission. Thus, there is no possibility to choose, since the interleaved signal in Sudo that proceeds to transmission, has been fixed beforehand in each mode (assuming that the "first transmissions" and "re-transmissions" represent the claimed modes of operation). Thus, Sudo merely discloses a solution similar to the one described in the Background section of the Applicant's specification. The Background section describes that the symbol interleaver was only usable in a certain mode of operation (e.g., a 2k interleaver merely in 2k mode, or an 8k interleaver in 8k mode).

In the event the Examiner persists that Sudo discloses some sort of a selection, it is submitted that the cited disclosure in Sudo can, at most, only teach <u>a selection between already interleaved signals. This is, however, in contrast to the claimed invention in which the selection is performed between interleavers.</u> One of the advantages of Applicant's claimed invention over Sudo is that Applicant's claimed invention enables the selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission.

By contrast, in Sudo, there is no freedom to select a symbol interleaver, much less is there the freedom to select both an available symbol interleaver from a plurality of interleavers and select a mode of operation. This represents a clear advantage of Applicant's claimed invention in flexibility, adaptability to a variety of signaling conditions, and process efficiency.

Furthermore, the Applicant believes that in Sudo, in addition to the missing selection of a symbol interleaver, there is also no teaching about selecting a mode of operation. Assuming that

the "first transmissions" and "re-transmissions" represent the claimed modes of operation, it is submitted that there is no possibility for one to choose between them. To the contrary, the fact whether a transmission is a first transmission or re-transmission is automatically determined by fixed factors. For example, one can not select a transmission to be a "re-transmission" if there has not been a first transmission earlier. Also, one can not select a transmission to be a "first transmission" if there has been one already. The foregoing means that the modes of operation in Sudo are not selectable at all.

Neither Sudo nor any of the prior art of record, discloses or suggests the Applicant's claimed selecting a symbol interleaver from a plurality of symbol interleavers available for use in a selected mode of operation. In prior art of record, e.g., in Sudo, there is only one interleaver available in each mode, this being the pre-defined interleaver that has been fixed beforehand. This is in contrast the Applicant's claimed invention, in which the feature of selecting from a plurality of available modes provides the advantage of selecting for a given operational mode, a symbol interleaver different from the one originally associated with the mode in question (e.g., 8k interleaver in 2k operational mode). In this manner, the Applicant's claimed invention provides flexibility and a possibility to affect the interleaving depth by the selection.

The Sipola Reference

The Applicant's prior remarks distinguishing the Sipola reference is incorporated herein by reference from the Applicant's April 14, 2008 amendment in response to the Office Action dated February 15, 2008.

In the second cited reference to Sipola, the number of symbol blocks to be interleaved determines the interleaving depth. Further according to Sipola, the interleaving depth is selected based on bit-error-rate measurements that are made at regular intervals. Sipola discloses that the interleaving depth and the type of interleaving method are selected for each symbol block, based on the number of symbol blocks to be interleaved. By contrast in the Applicants' claimed invention, the interleaver is selected and then applied to a number of blocks. There is no disclosure or suggestion of the Applicant's claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol

interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission.

In the cited references, the size of the symbol interleaver and the size of the symbol to be interleaved are the same. This means that, for example, an 8K interleaver is used in an 8K operating mode, and a 2K interleaver is used in a 2K operating mode. However, when the system operates in 4K or 2K modes, the symbol interleaving depth is sometimes too small.

The solution presented in the Applicant's claimed invention enables selecting a symbol interleaver which was originally designed for a certain mode, to be used in another mode. In the Applicant's claimed invention, the 8K symbol interleaver can be used, for example, in 2K mode, wherein the interleaving depth becomes greater. This is due to the fact that the amount of data to be interleaved at a time (i.e., the block size) in 8K mode is greater than that in 2K mode. When 8K symbol interleaver is used in 2K mode, this means that interleaving is performed over four 2K symbols instead of one 2K symbol. None of the cited references discloses or suggests selecting a symbol interleaver from a plurality of available symbol interleavers, as claimed by the Applicant.

Allegation of "Applicants' Admitted Prior Art".

The Examiner refers to "Applicant's Admitted Prior Art" ("AAPA"), which the Examiner identifies as the Applicant's specification at the paragraphs 2,7, 41-42, 52, and 55.

The Applicant's specification at the paragraphs 2,7, 41-42, 52, and 55 cited by the Examiner, read as follows:

> [0002] Coded orthogonal frequency division multiplexing (COFDM) modulation is used in broadcasting (or multicasting or unicasting) broadband digital signals from a transmitter to a plurality of receivers. As one example, DVB-T (Digital Video Broadcasting-Terrestrial) system as defined in the standard ETSI (the European Telecommunications Standards Institute) EN 300 744 (Version 1.4.1) is a system in which coded orthogonal frequency division multiplexing (COFDM)

modulation method is used in broadcasting (or multicasting) broadband digital television signals from a DVB-T transmitter to a plurality of DVB-T receivers.

[0007] Mapping of digital data (data words, also referred to as bit words or data units) onto the active carriers is performed in the inner interleaver. More particularly, this task is done by the symbol interleaver. A separate "2K symbol interleaver" has been defined for 2K mode and an "8K symbol interleaver" for 8K mode. In 2K mode, the 2K symbol interleaver maps 1512 data words (that is 12 groups of 126 data words, wherein the length v of each data word is v=2, 4 or 6 bits depending on the used modulation method)) coming from the set of bit-interleavers onto the 1512 active carriers of one 2K mode OFDM-symbol. Similarly, in 8K mode, the 8K symbol interleaver maps 6048 data words (48 groups of 126 data words) onto the 6048 active carriers of one 8K mode OFDM-symbol.

[0041] FIG. 1 shows an inner interleaver according to the DVB-T standard;

[0042] FIG. 2 shows the symbol interleaving principle of the DVB-T standard;

[0052] FIG. 1 shows an inner interleaver 100 as defined in the DVB-T standard ETSI EN 300 744 (Version 1.4.1). FIG. 1 is applicable also for the description of the invention. The inner interleaver can be implemented either by hardware or software or their combination. A hardware implementation on suitable semiconductor components is preferable. An input stream x.sub.0,x.sub.1,x.sub.2, . . . is demultiplexed in a demultiplexer 110 into v sub-streams, wherein v is the number of bits per one modulation symbol. In the exemplary case of FIG. 1, the used modulation method is 16-QAM (Quadrature Amplitude Modulation) in which the number of bits per one modulation symbol is 4 (v=4).

[0055] The output bit streams of the v bit interleavers (in this exemplary case v=4) are conveyed to a symbol interleaver 130. The output bit streams are grouped in order to form data words, so that each data word of v bits (v=4) will have one bit from each of the bit-interleavers. In this way, 126 data words each consisting of v bits are formed. The symbol interleaver 130 interleaves these data words. It is to be noted that in the symbol interleaver the bits of the data words are not interleaved but the whole data words are. In the 2K mode, as defined in the standard, 12 groups of 126 data words (12*126=1512) are interleaved for the purpose of mapping them onto the 1512 active carriers of one 2K mode OFDM-

symbol. Accordingly, the block size of 2K symbol interleaver is 1512 data words. Similarly, in the 8K mode, 48 groups of 126 data words (48*126=6048) are interleaved for the purpose of mapping them onto the 6048 active carriers of one 8K mode OFDM-symbol. Accordingly, the block size of 8K symbol interleaver is 6048 data words. Depending on the implementation, the symbol interleavers of different modes (2K mode, 8K mode) may be implemented as separate symbol interleaver components or they may be integrated into a single `combined` symbol interleaver.

However, there is no disclosure or suggestion in Applicant's background description in the specification at the paragraphs 2,7, 41-42, 52, and 55 cited by the Examiner as "AAPA", of the Applicant's claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission

There is no disclosure or suggestion in combination of Hiroaki Sudo v/o Sipola and AAPA, of the Applicant's claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission.

B.   Claims 17-18 - Sudo , Sipola, AAPA, and ETSI EN 300744 V1.4.1 (2001-01).

Claims 17-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hiroaki Sudo (USPN 6,950,474) in view of Sipola (US 2002/0044612) with AAPA as applied to claim 15 above, and further in view of ETSI EN 300744 V1.4.1 (2001-01).

The Examiner admits that Hiroaki Sudo does not explicitly teach a transmission system wherein the transmitter is arranged to transmit information indicative of said selected symbol

interleaver to an OFDM receiver, wherein one or more TPS (Transmission Parameter Signaling) bits are arranged to convey said information indicative of said selected symbol interleaver.

The Examiner then alleges that ETSI EN 300744 V1.4.1 at pages 30-32, table 9 and 15, teaches a transmission system wherein the transmitter is arranged to transmit information indicative of said selected symbol interleaver to an OFDM receiver. The Examiner's rejection reads as follows:

> TPS (Transmission Parameter Signaling) bits inherently disclose bit which indicate the operating mode of the transmitter, including modulation and coding. One of ordinary skill in the art would clearly understand that it would be obvious to modify the signal information bits (ETSI EN 300744 V1.4.1: page 30) of the preamble in order to let the receiver know the correct decoding (including interleaving) and demodulation methods to derive the original data without adding de-coding error.
> Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the system of Hiroaki in order to use the control information bits of ETSI EN 300744 V1.4.1 in order to have the receiver correctly derive the original data without adding de-coding error and also have the wireless system compatible with a major standard in the global community, thereby increasing marketability and profitability.

The ETSI EN 300744 V1.4.1 reference, on page 29, describes what the TPS carriers convey, which reads as follows:

> The TPS carriers convey information on:
>
> a) modulation including the α value of the QAM constellation pattern (see note);
>
> b) hierarchy information;
>
> c) guard interval (not for initial acquisition but for supporting initial response of the receiver in case of
>
> reconfiguration);
>
> d) inner code rates;
>
> e) transmission mode (2K or 8K, not for the initial acquisition but for supporting initial response of the receiver in case of reconfiguration);
>
> f) frame number in a super-frame;
>
> g) cell identification.

NOTE: The α value defines the modulation based on the cloud spacing of a generalized QAM constellation.

It allows specification of uniform and non-uniform modulation schemes, covering QPSK, 16-QAM, and 64-QAM.

The above Item "e)" on page 29 of the ETSI reference indicates TPS carriers convey the transmission mode (2K or 8K). But, this is not a disclosure or suggestion in ETSI EN 300744 V1.4.1, of the Applicant's claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission

There is no disclosure or suggestion in combination of Sudo , Sipola, AAPA, and ETSI EN 300744 V1.4.1, of the Applicant's claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission.

C.   Claims 22-23 Sudo v/o Sipola and Hosur

Claims 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiroaki Sudo US patent 6950474 in view of Sipola US Published Application 2002/0044612 with AAPA and further in view of Hosur US Published Application 2001/0033623.

The Applicant's prior remarks distinguishing the Hosur reference are incorporated herein by reference from the Applicant's April 14, 2008 amendment in response to the Office Action dated February 15, 2008.

Hosur discloses a frequency division multiplexing wireless transmission on two or more antennas with the set of symbols on subcarriers of a burst transmitted by one antenna transformed into another set of symbols on the subcarriers for the corresponding burst transmitted by another antenna.

The Hosur reference does not disclose or suggest the Applicant's claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission.

The combination of Hiroaki Sudo and Sipola and the AAPA and Hosur fails to disclose or suggest the Applicants' claimed selection of both a mode of operation and the selection of a symbol interleaver from a plurality of symbol interleavers available for symbol interleaving in the selected mode of operation, wherein the selection of the symbol interleaver is based on a desired depth of interleaving and the selected mode of operation is associated with the number of active carriers for payload data transmission.

CONCLUSION

Based on the foregoing amendments and remarks, Applicants respectfully request reconsideration and withdrawal of the rejection of claims and allowance of this application.

AUTHORIZATION

The Commissioner is hereby authorized to charge any additional fees which may be required for consideration of this Amendment to Deposit Account No. **13-4500**, Order No. 4208-4234.

In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to

grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No **13-4500**, Order No. 4208-4234.

Respectfully submitted,
MORGAN & FINNEGAN, L.L.P.

Dated: September 30, 2008   By: _____

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